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Intuitionistic Fuzzy Filters of Lattice Wajsberg Algebra

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Abstract: A new kind of filter called Intuitionistic Fuzzy Filter(IFF) is defined and another filter called Intuitionistic Fuzzy Lattice Filter(IFLF) are also introduced in Lattice Wajsberg algebra. Some theorems are stated and proved. Every IFLF is an IFF in Lattice Wajsberg algebra, which is proven.

Keywords: Implicative Filter, Wajsberg algebra, Lattice Wajsberg Algebra, Intuitionistic Fuzzy Filter(IFF), Intuitionistic Fuzzy Lattice Filter(IFLF)

1 Introduction

Atanassov[1] presented intuitionistic fuzzy sets in 1986 as an expansion of Lotfi Zadeh's thought of fuzzy set, which itself expands the established idea of a set. The hypothesis of Wajsberg algebras(W-algebras) was presented by Font et al [3].

The hypothesis of filters merits an imperative job in the learning way of consistent algebras. Numerous analysts realizing the criticalness considered fuzzy filters which handle questionable data. In BCI algebras fuzzy filters, BCH algebras, R_0 algebras intuitionistic fuzzy filters were set up [6,4,5].Wei et al[9] exhibited the ideas of fuzzy filters hypothesis and their properties in BL algebras in 2008. Similar ideas of filters were produced in BL algebras by Xue et al[10]. Basheer et al[2] presented the fuzzy implicative filter in lattice Wajsberg algebra based. Sathya et al [7,8] presented the thought of Intuitioistic Fuzzy Implicative Filters (IFIF), Intuitioistic Fuzzy Prime filters(IFPF) and Intuitioistic Fuzzy Boolean filters (IFBF) of lattice Wajsberg algebras.

2 Preliminaries

Definition 2.1.[3] An algebra $(L,\rightarrow,*,1)$ is said to be a Wajsberg algebra(W-algebra) if and only if
(W1)$1\rightarrow x = x$
(W2)$(x\rightarrow y)\rightarrow((y\rightarrow z)\rightarrow(x\rightarrow z)) = 1$
(W3)$(x\rightarrow y)\rightarrow y = (y\rightarrow x)\rightarrow x$
(W4)$(x^*\rightarrow y^*)\rightarrow(y\rightarrow x) = 1 \forall x,y,z\in L.$

Proposition 2.2.[3] The W-algebra $(L,\rightarrow,*,1)$ for all $x,y,z\in L$
(1)If $x\rightarrow y = y\rightarrow x = 1$ then $x = y$
(2)$x\rightarrow 1 = 1$
(3)$x\rightarrow x = 1$
(4)If $x\rightarrow y = y\rightarrow z = 1$ then $x\rightarrow z = 1$
(5)$(x\rightarrow y)\rightarrow((z\rightarrow x)\rightarrow(z\rightarrow y)) = 1$
(6)$x\rightarrow(y\rightarrow z) = y\rightarrow(x\rightarrow z)$
(7)$x\rightarrow 0 = x\rightarrow 1^* = x^*$
(8)$(x^*)^* = x$
(9)$x\rightarrow(y\rightarrow x) = 1$
(10)$x^*\rightarrow y^* = y\rightarrow x$
(11)If $x\leq y$ then $y\rightarrow z\leq x\rightarrow z$
(12)$(x\vee y)^* = (x^*\wedge y^*)$
(13)$(x\wedge y)^* = (x^*\vee y^*)$
(14)$(x\vee y)\rightarrow z = (x\rightarrow z)\wedge(y\rightarrow z)$
(15)$x\rightarrow(y\wedge z) = (x\rightarrow y)\wedge(x\rightarrow z)$
(16)If $x\leq y$ then $z\rightarrow x\leq z\rightarrow y$

Definition 2.3.[3] The W-algebra L is said to be a Lattice W-algebra if
(1) Partial ordering $\leq$ on L, $x\leq y$ iff $x\rightarrow y = 1$
(2)$x\wedge y = ((x^*\rightarrow y^*)\rightarrow y^*)^*$
(3)$x\vee y = ((x\rightarrow y)\rightarrow y)\forall x,y\in L.$

Definition 2.4.[3] A subset F of a lattice Wajsberg algebra L is said to be an implicative filter of lattice Wajsberg algebra if

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Table 1: Operator $*$ in W

u	u^*
0	1
m	v
q	s
v	m
s	q
1	0

Table 2: Operator $\rightarrow$ in W

$\rightarrow$	0	m	q	v	s	1
0	1	1	1	1	1	1
m	v	1	q	v	q	1
q	s	m	1	q	m	1
v	m	m	1	1	m	1
s	q	1	1	q	1	1
1	0	m	q	v	s	1

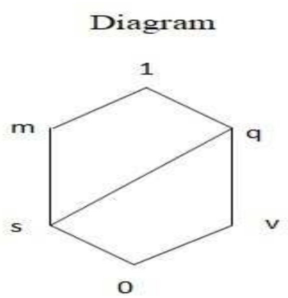
(1)$1 \in F$
(2)$x \in F$ and $x \rightarrow y \in F$ imply $y \in F$ for all x,y in L.

Definition 2.5.[1]$A = \{(x, \mu_A(x), \gamma_A(x)/x \in X)\}$ be an Intuitionistic Fuzzy Set (IFS), the function $\mu_A : X \rightarrow [0,1]$, $\gamma_A : X \rightarrow [0,1]$ and $0 \leq \mu_A(x) + \gamma_A(x) \leq 1$ for any $x \in X$.

3 Intuitionistic Fuzzy Filter(IFF)

Definition 3.1. An Intuitionistic Fuzzy Set (IFS) G is said to be an Intuitionistic Fuzzy Filter (IFF) of lattice Wajsberg algebra(lattice W- algebra) W if for all $u, v \in W$
(IF1)$\mu_G(1) \geq \mu_G(u)$; $\gamma_G(1) \leq \gamma_G(u)$
(IF2)min$\{\mu_G(u \rightarrow v), \mu_G(u)\} \leq \mu_G(v)$;
max $\{\gamma_G(u \rightarrow v), \gamma_G(u)\} \geq \gamma_G(v)$.

Example 3.2.$W = \{0, m, q, v, s, 1\}$ be a lattice Wajsberg algebra defined as in the diagram, Table 1 and Table 2



An intuitionistic fuzzy set G in W defined as

$$\mu_G(u) = \begin{cases} 0.8 \ if u = 1 \\ 0.2 \ if u \neq 1 \end{cases}$$

$$\gamma_G(u) = \begin{cases} 0.1 \ if u = 1, \\ 0.6 \ if u \neq 1 for u \in W. \end{cases}$$

Clearly (IF1) is true for all $u \in W$
Now for $0, p \in W$,
$\mu_G(p) \geq min\{\mu_G(0 \rightarrow p), \mu_G(0)\}$
For $p, s \in W$ then
$\gamma_G(s) \leq max\{\gamma_G(p \rightarrow s), \gamma_G(p)\}$
Thus (IF2) is true for all $u, v \in W$.
G is an IFF of W.

Theorem 3.3. Let G be an IFF of Lattice W-algebra .
$\mu_G(u) \leq \mu_G(v)$and $\gamma_G(u) \geq \gamma_G(v)$ for all $u, v \in W$ when $u \leq v$.

Proof. Assume that G is an IFF.
Combine $u \leq v$ and the definitions of lattice Wajsberg algebra
$\mu_G(u \rightarrow v) = \mu_G(1)$——(i)
In (IF2)$\mu_G(v) \geq min\{(\mu_G(u \rightarrow v), \mu_G(u))\}$
Using(IF1)and (i)gives that $\mu_G(v) \geq \mu_G(u)$
Combine $u \leq v$ and the definitions of lattice Wajsberg algebra
$\gamma_G(u \rightarrow v) = \gamma_G(1)$——(ii)
In (IF2)$\gamma_G(v) \leq max\{\gamma_G(u \rightarrow v), \gamma_G(u)\}$
using(IF1)and (ii)gives that $\gamma_G(v) \leq \gamma_G(u)$.

Theorem 3.4. An IFS G is an IFF of a lattice W-algebra W iff
(1)$\mu_G(1) \geq \mu_G(u)$,$\gamma_G(1) \leq \gamma_G(u)$
(2)$\mu_G(u \rightarrow w) \geq min\{\mu_G(u \rightarrow v), \mu_G(v \rightarrow w)\}$
(3)$\gamma_G(u \rightarrow w) \leq max\{\gamma_G(u \rightarrow v), \gamma_G(v \rightarrow w)\}$
for any $u, v, w \in W$.

Proof.Necessity: Let G be an IFF of W.
The condition (1) is true by (IF1).
From the definition of W-algebra $(u \rightarrow v) \rightarrow ((v \rightarrow w) \rightarrow (u \rightarrow w)) = 1$ is true.
From the definition of Lattice Wajsberg algebra
$(u \rightarrow v) \leq ((v \rightarrow w) \rightarrow (u \rightarrow w))$——(i)
Also by the condition (IF2)
$\mu_G(u \rightarrow w) \geq min\{\mu_G((v \rightarrow w) \rightarrow (u \rightarrow w)), \mu_G(v \rightarrow w)\}$
$\gamma_G(u \rightarrow w) \leq max\{\gamma_G((v \rightarrow w) \rightarrow (u \rightarrow w)), \gamma_G(v \rightarrow w)\}$
Using Theorem 3.3 in (i)and then above equation becomes
$\mu_G(u \rightarrow v) \geq min\{\mu_G(u \rightarrow v), \mu_G(v \rightarrow w)\}$
$\gamma_G(u \rightarrow v) \leq max\{\gamma_G(u \rightarrow v), \gamma_G(v \rightarrow w)\}$
The condition (2) and (3) are true for all $u, v, w \in W$
Sufficiency: Suppose that W satisfies conditions (1),(2)and(3).
Obviously, from(1),the first condition(IF1) of IFF is true.
Taking $u = 1$ in (2) and (3)
$\mu_G(w) \geq min\{\mu_G(v), \mu_G(v \rightarrow w)\}$
$\gamma_G(w) \leq max\{\gamma_G(v), \gamma_G(v \rightarrow w)\}$

(IF2) is true for all $u,v,w \in W$.
Hence G is an IFF of W.

Theorem 3.5. Let G be an IFS. Then G is an IFF of a lattice W- algebra W if and only if it satisfies
(1)$\mu_G(1) \geq \mu_G(u)$,$\gamma_G(1) \leq \gamma_G(u)$
(2)$\mu_G(w) \geq \min\{\mu_G(v \to (u \to w)), \mu_G(v), \mu_G(u)\}$
(3)$\gamma_G(w) \leq \max\{\gamma_G(v \to (u \to w)), \gamma_G(v), \gamma_G(u)\}$
for any $u,v,w \in W$.

Proof.Necessity: Let G is an IFF of W
The condition (1) is true.
From (IF2)$\mu_G(w) \geq min\{\mu_G(u \to w), \mu_G(u)\}$
$\mu_G(u \to w) \geq min\{\mu_G(v \to (u \to w)), \mu_G(v)\}$
Hence $\mu_G(w) \geq min\{\mu_G(v \to (u \to w)), \mu_G(v), \mu_G(u)\}$
The conditions (2) is true for all $u,v,w \in W$.
Also $\gamma_G(w) \leq max\{\gamma_G(u \to w), \gamma_G(u)\}$
$\gamma_G(u \to w) \leq max\{\gamma_G(v \to (u \to w)), \gamma_G(v)\}$
Hence $\gamma_G(w) \leq max\{(\gamma_G(u \to w), \gamma_G(u)\}$
$\leq max\{(\gamma_G(v \to (u \to w)), \gamma_G(v), \gamma_G(u)\}$
The conditions (3) is true for all $u,v,w \in W$.
Sufficiency: Let the conditions (1),(2)and (3) hold in G.

From (1), the first condition (IF1) of IFF is satisfied. Taking v=u in (2)
$\mu_G(w) \geq \min\{\mu_G(v \to (u \to w)), \mu_G(v), \mu_G(u)\}$
$\mu_G(w) \geq \min\{\mu_G(u \to (u \to w)), \mu_G(u), \mu_G(u)\}$
By Proposition 2.1 and definition 2.4
$(u \to w) \to (u \to (u \to w)) = 1$
$\Leftrightarrow (u \to w) \leq (u \to (u \to w))$
Apply Theorem 3.3 $\mu_G(u \to w) \leq \mu_G(u \to (u \to w))$
$\gamma_G(u \to w) \geq \gamma_G(u \to (u \to w))$
Hence $\mu_G(w) \geq \min\{\mu_G(u \to w), \mu_G(u)\}$
Taking v=u in (3)
$\gamma_G(w) \leq \max\{\mu_G(u \to (u \to w)), \mu_G(u)\}$
$\gamma_G(w) \leq \max\{\gamma_G(u \to w), \gamma_G(u)\}$ for all $u,v,w \in W$.
Hence G is an IFF of W.

Corollary 3.6. Let G be IFF of a lattice W-algebra W. Then $\mu_G(v) \geq \mu_G(u)$,$\gamma_G(v) \leq \gamma_G(u)$ for all $u,v \in W$ be true when $\mu_G(u \to v) = \mu_G(1)$,$\gamma_G(u \to v) = \gamma_G(1)$.

Proof. Let G be an IFF of W and
$\mu_G(u \to v) = \mu_G(1)$,$\gamma_G(u \to v) = \gamma_G(1)$ —-(i)
Using (IF2) and (i)
$\mu_G(v) \geq \mu_G(u)$,$\gamma_G(v) \leq \gamma_G(u)$ for all $u,v \in W$.

Theorem 3.7. In a lattice W-algebra W, an IFS G be an IFF of W iff $(u \to w)^* \to v^* = 1$ implies
$\mu_G(w) \geq min\{\mu_G(u), \mu_G(v)\}$
$\gamma_G(w) \leq max\{\gamma_G(u), \gamma_G(v)\}$ for all $u,v,w \in W$.

Proof.Necessity: Assume that G be an IFF and $(u \to w)^* \to v^* = 1$
$\mu_G(u \to w) \geq min\{\mu_G(v), \mu_G(v \to (u \to w))\}$——(i)
$\mu_G(w) \geq min\{\mu_G(u), \mu_G(u \to w)\}$——(ii)
By Proposition 2.2 and $(u \to w)^* \to v^* = 1$ in (i)
$\mu_G(u \to w) \geq \mu_G(v)$——(iii)
Use (iii) in (ii)
$\mu_G(w) \geq min\{\mu_G(u), \mu_G(v)\}$
$\gamma_G(u \to w) \leq max\{\gamma_G(v), \gamma_G(v \to (u \to w))\}$——(iv)
$\gamma_G(w) \leq max\{\gamma_G(u), \gamma_G(u \to w)\}$——(v)
By Proposition 2.2 and $(u \to w)^* \to v^* = 1$ in (iv)
$\gamma_G(u \to w) \leq \gamma_G(v)$——(vi)
Use (vi) in (v)
$\gamma_G(w) \leq max\{\gamma_G(u), \gamma_G(v)\}$.

Sufficiency: Assume that $(u \to w)^* \to v^* = 1$ and
$\mu_G(w) \geq min\{\mu_G(u), \mu_G(v)\}$
$\gamma_G(w) \leq max\{\gamma_G(u), \gamma_G(v)\}$ for all $u,v,w \in W$are true.
Then $(u \to 1)^* \to u^* = 1$ is true for all $u \in W$, the condition (IF1) holds.
$(u \to v)^* \to (u \to v)^* = 1$ is true for all $u,v \in W$, the condition (IF2) holds .
Hence G be an IFF of W.

Theorem 3.8. Intersection of two intuitionistic fuzzy filters of lattice W-algebra is also an intuitionistic fuzzy filter.

Proof. Let G and H be intuitionistic fuzzy filters of W and assume that $(u \to w)^* \to v^* = 1$ for all $u,v,w \in W$.
Then by Theorem3.7,
$\mu_G(w) \geq min\{\mu_G(u), \mu_G(v)\}$;$\gamma_G(w) \leq \max\{\gamma_G(u), \gamma_G(v)\}$
Also $\mu_H(w) \geq \min\{(\mu_H(u), \mu_H(v)\}$
$\gamma_H(w) \leq \max\{(\gamma_H(u), \gamma_H(v)\}$
Now $(\mu_G \wedge \mu_H)(w) \geq \mu_G(w) \wedge \mu_H(w)$
$\geq (\mu_G \wedge \mu_H)(u) \wedge (\mu_G \wedge \mu_H)(v)$
And $(\gamma_G \wedge \gamma_H)(w) \leq \gamma_G(w) \vee \mu_H(w)$
$\leq (\gamma_G \vee \gamma_H)(u) \vee (\gamma_G \vee \gamma_H)(v)$
Hence by Theorem 3.7, intersection of G and H be an IFF.

Lemma 3.9. Let G be an IFF of W. For any $u,v,w \in W$ the following results hold
(1) If $u \leq v$, then
$\mu_G(w \to u) \leq \mu_G(w \to v)$;$\gamma_G(w \to u) \geq \gamma_G(w \to v)$
(2) $\mu_G(u \to v) \leq \mu_G((v \to w) \to (u \to w))$;
$\gamma_G(u \to v) \geq \gamma_G((v \to w) \to (u \to w))$
(3) $\mu_G(u \to v) \leq \mu_G((w \to u) \to (w \to v))$;
$\gamma_G(u \to v) \geq \gamma_G((w \to u) \to (w \to v))$
(4) $\mu_G(u^* \to v^*) \leq \mu_G(v \to u)$;
$\gamma_G(u^* \to v^*) \geq \gamma_G(v \to u)$
(5) If $u \leq v$, then $\mu_G(v \to w) \leq \mu_G(u \to w)$;
$\gamma_G(v \to w) \geq \gamma_G(u \to w)$
(6) If $u \to v = v \to w = 1$, then
$\mu_G(u) \leq \mu_G(w)$;$\gamma_G(u) \geq \gamma_G(w)$
(7) $\mu_G(u \to (u \to w)) \geq min\{\mu_G(u \to (v \to w)), \mu_G(u \to w)\}$;
$\gamma_G(u \to (u \to w)) \leq max\{\gamma_G(u \to (v \to w)), \gamma(u \to w)\}$.

Theorem 3.10. Let G be an IFF in lattice W-algebra W. The sets $S = \{u/u \in W, \mu_G(u) = \mu_G(1)\}$ and $T = \{u/u \in W, \gamma_G(u) = \gamma_G(1)\}$ are implicative filters of W .

Proof. Clearly $1 \in S$.Let $u \in S, u \to v \in S$.
Then by the definition 3.1 and by the set S.
$\mu_G(v) \geq \mu_G(1)$——(i)
By condition (IF1) and(i)
$\mu_G(v) = \mu_G(1)$,which implies $v \in S$
Hence S be an implicative filter of W .
Let $u \in T, u \to v \in T$.
Then by the definition 3.1 and by the set S
$\gamma_G(v) \geq \gamma_G(1)$——(ii)
By condition (IF1) and(ii)$\gamma_G(v) = \gamma_G(1)$,

which implies $v \in T$
Hence T be an implicative filter of W .

Theorem 3.11. Let $(\mu_G)_{(t)} = \{u \in W/\mu_G(u) \geq t\}, (\gamma_G)_{(s)} = \{u \in W/\gamma_G(u) \leq s\}$. An IFS G be an IFF of lattice W- algebra iff for every $s,t \in [0,1]$, the set$(\mu_G)_{(t)}$ and $(\gamma_G)_{(s)}$ are either empty or implicative filter of W.
Proof.Necessity: Assume that G be an IFF of W and $(\mu_G)_{(t)} \neq \phi, (\gamma_G)_{(s)} \neq \phi$.
$\mu_G(1) \geq \mu_G(a)$,$\gamma_G(1) \leq \gamma_G(a)$———(i)
Since $(\mu_G)_{(t)} \neq \phi, (\gamma_G)_{(s)} \neq \phi$,
$\exists$ an element $a \in (\mu_G)_{(t)}, a \in (\gamma_G)_{(s)}$
such that $\mu_G(a) \geq t, \gamma_G(a) \leq s$———(ii)
From (i) and (ii) $\mu_G(1) \geq t, \gamma_G(1) \leq s$.
Hence $1 \in (\mu_G)_{(t)}, 1 \in (\gamma_G)_{(s)}$
Let $u, u \to v \in (\mu_G)_{(t)}$.
Since G be an IFF,$\mu_G(v) \geq min\{\mu_G(u), \mu_G(u \to v)\} = t$.
Hence $v \in (\mu_G)_{(t)}$
Also $\gamma_G(v) \leq max\{\gamma_G(u), \gamma_G(u \to v)\} = s$.
Hence $v \in (\gamma_G)_{(s)}$
Therefore$(\mu_G)_{(t)}$ and $(\gamma_G)_{(s)}$ are implicative filters of W.

Sufficiency: Suppose that $(\mu_G)_{(t)}$ and $(\gamma_G)_{(s)}$ are either empty or implicative filters of W.
$1 \in (\mu_G)_{(t)}; u, u \to v \in (\mu_G)_{(t)}$then $v \in (\mu_G)_{(t)}$.
$1 \in (\gamma_G)_{(s)}; u, u \to v \in (\gamma_G)_{(s)}$ then $v \in (\gamma_G)_{(s)}$.
Let $t = \mu_G(u), s = \gamma_G(u)$.
Then $\mu_G(1) \geq t = \mu_G(u), \gamma_G(1) \leq s = \gamma_G(u)$
$\mu_G(u) \geq t, \mu_G(u \to v) \geq t; \gamma_G(u) \leq s; \gamma_G(u \to v) \leq s$.
Let $min\{\mu_G(u), \mu_G(u \to v)\} = t$
and $max\{\gamma_G(u), \gamma_G(u \to v)\} = s$
$\mu_G(v) \geq t = min\{\mu_G(u), \mu_G(u \to v)\}$,
$\gamma(v) \leq s = max\{\gamma_G(u), \gamma_G(u \to v)\}$.
Hence G is an IFF of W.

Definition 3.12. Let W be lattice Wajsberg algebra(lattice W-algebra) and IFS G is said to be an Intuitionistic Fuzzy Lattice Filter (IFLF) of W if
$(IFLF1)\mu_G(u \wedge v) = \mu_G(u) \wedge \mu_G(v)$
$(IFLF2)\gamma_G(u \wedge v) = \gamma_G(u) \vee \gamma_G(v) \forall u, v \in W$.

Example 3.13.$W = \{0, m, v, r, 1\}$ is a lattice W-algebra defined as in the diagram, Table 3 and Table 4

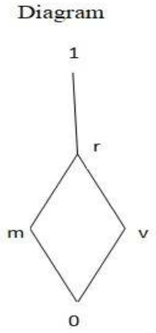


Table 3: Operator $*$ in W

u	u^*
0	1
m	v
v	m
r	r
1	0

Table 4: Operator $\to$ in W

$\to$	0	m	v	r	1
0	1	1	1	1	1
m	v	1	r	1	1
v	m	r	1	1	1
r	r	r	r	1	1
1	0	m	q	r	1

An intuitionistic fuzzy set G in W is defined as

$$\gamma_G(u) = \begin{cases} 0.1 & if u = 1 \\ 0.6 & if u \neq 1 where u \in W \end{cases}$$

Then G is an IFLF of W.

Theorem 3.14. Every IFF is an IFLF.

Proof. From the definition of IFF
$\mu_G(u \wedge v) \geq min\{\mu_G(u \to (u \wedge v)), \mu_G(u)\}$
$= min\{\mu_G(u \to v), \mu_G(u)\}$
$\geq min\{min\{\mu_G(v \to (u \to v)), \mu_G(v)\}\mu_G(u)\}$
$= min\{min\{\mu_G(1), \mu_G(v)\}\mu_G(u)\}$
$= \mu_G(u) \wedge \mu_G(v)$——-(i)
$u \wedge v \leq u$, $u \wedge v \leq v$ and by Theorem3.3,
$\mu_G(u \wedge v) \leq \mu_G(u) \wedge \mu_G(v)$———(ii)
From (i) and (ii)$\mu_G(u \wedge v) = \mu_G(u) \wedge \mu_G(v)$
From the definition of IFF
$\gamma_G(u \wedge v) \leq max\{\gamma_G(u \to (u \wedge v)), \gamma_G(u)\}$
$= max\{\gamma_G(u \to v), \gamma_G(u)\}$
$\leq max\{min\{\gamma_G(v \to (u \to v)), \gamma_G(v)\}\gamma_G(u)\}$
$= max\{max\{\gamma_G(1), \gamma_G(v)\}\gamma_G(u)\}$
$= \gamma_G(u) \vee \gamma_G(v)$——-(iii)
$u \wedge v \leq u$, $u \wedge v \leq v$ and by Theorem3.3,
$\gamma_G(u \wedge v) \geq \gamma_G(u) \vee \gamma_G(v)$———(iv)
From (iii) and (iv)$\gamma_G(u \wedge v) = \gamma_G(u) \wedge \gamma_G(v)$
Hence IFF is an IFLF.

4 Conclusion

IFF in lattice Wajsberg algebra has been introduced in this paper. Some of the equivalent conditions for an IFS to be an intuitionistic fuzzy filter are established. In addition, IFLF is defined and the relationship between these two filters is derived.

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References

[1] K.T. Atanassov, Intuitionistic fuzzy sets, Fuzzy Sets and Systems,20, 87-96 (1986).
[2] M. Basheer Ahamed, A. Irahim, Fuzzy implicative filters of Lattice Wajsberg algebras, Advances in Fuzzy Mathematics,6, 235-243 (2011).
[3] J.M. Font, A.J Rodriguez, A. Torrens, Wajsberg Algebras, STOCHASTICA,8, 5-31 (1984).
[4] H.J. Jung, M. Kondo, S.M. Hong, Intuitionistic Fuzzy Filters in BCH-algebra,7, 337-345 (2002).
[5] L. Lianzhen, L. Kaitai, Fuzzy implicative and Boolean filters R_0 algebras, Information sciences,171,61-71 (2005).
[6] Ma XL, Intuitionistic fuzzy filters of BCI-algebras, J. Hubei. Inst. Nation.(Nat Sci Edn),25, 39-41 (2007).
[7] S. Sathya, D. Kalamani, K. Arun Prakash, Intuitioistic Fuzzy Implicative filters of Lattice Wajsberg algebras,Asian Journal of Research in Social Sciences and Humanities,7,424-437 (2017).
[8] S. Sathya, D. Kalamani, K. Arun Prakash, Some types of Intuitioistic Fuzzy filters in lattice Wajsberg algebras, Taga Journal of Graphic Technology,14, No 26,(2018).
[9] W. Wei, A. B. Saeid, Solutions to Open problems on Fuzzy filters of BL-algebras, International Journal of Computational Intelligence systems,8, No.1,106-113 (2015).
[10] Z. Xue, Y. Xiao, W. Liu, H. Cheng, Y. Li, Intuitionistic fuzzy filter theory of BL-algebras, Int. J. Mach. Learn and Cyber.,4, 659-669 (2013).

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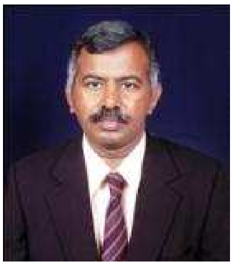

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